Manchester Environmental Laboratory

U.S. Environmental Protection Agency
Region 10
7411 Beach Drive East
Port Orchard, WA 98366

Annual Report

Fiscal Year 2003

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Executive Summary

The Manchester Laboratory provides analytical and technical support to virtually all Region 10 programs, the Criminal Investigation Division and some Headquarters programs. Spanning a wide range of activities from pH analyses to interpreting and defending complex analytical and technical data during criminal prosecutions, the Laboratory supports the Comprehensive Environmental Response, Compensation and Liability Act (Superfund), the Clean Water Act, the Safe Drinking Water Act, the Resource Conservation and Recovery Act, the Toxic Substances Control Act, and the Clean Air Act, to name the most prominent.

Manchester performed 11,004 analyses during FY2003. The analytical capacity of the Laboratory is enhanced by the presence of the Environmental Services Assistance Team (ESAT), a dedicated Superfund contractor. Accordingly, the Superfund program was the largest user of analytical services with about 61% of the total analytical throughput. Both the chemistry and microbiology mobile laboratories were kept busy in FY 2003, providing on-site support to the Superfund and Water Programs.

In addition to traditional laboratory analytical support to regional programs, we provided technical and analytical assistance to other public laboratories and programs. In a continuing effort to find better and more efficient ways to provide the environmental data foundation on which Agency decisions are based, we developed new analytical methods, tested instrumentation under development and provided valuable assistance to Headquarters programs as they also attempt to improve the state-of-the-art in laboratory science. One Centers of Applied Science project was completed in FY2003, improving our ability to detect contaminants in a variety of environmental matrices. To share this information and learn of developments elsewhere, Laboratory scientists were active in professional organizations, organizing meetings, moderating technical sessions and presenting the information they had developed.

Construction of a new laboratory wing was completed, housing trace metals laboratories and a microbiology suite for DNA-based analysis. With a minimum of metals in laboratory fixtures, we have been able to drive metals detection limits significantly downward. Design for Phase II of the Laboratory Modernization Program, refurbishing the 24 year old original laboratories, is currently underway. Phase II will be completed in three stages over the next few years and will result in virtually new laboratory space for the laboratory functions that have not moved to the new wing.

Not unlike much of the rest of the federal government, an exodus of senior scientists and staff has begun at the laboratory. Although a very productive senior chemist retired last year and was replaced by a part-time student, laboratory throughput remained approximately level through improvements in methods, instrumentation and hard work. However, contemporaneous, budget-driven reductions in contract analytical resources are stressing our ability to deliver the laboratory science support the Region needs to support Agency decisions. It is imperative that departing scientists be replaced to insure that the quality science so critical to credible Agency decisions can be delivered.

Mission Statement

Regional laboratories apply science policies, principles and methods to support regulatory programs, monitoring programs and special projects. Regional laboratory expertise is directed at a daunting array of environmental issues through direct implementation and leveraged through partnerships with state, local and tribal governments, private industry, the academic community, EPA program offices, ORD and the public. Regional laboratories are crucial to advancing the Agency's science agenda through the application of the following principles:

Integrate laboratory activities with those of field and quality assurance partners into a comprehensive, holistic, multi-media approach to solving ecosystem-based environmental problems.

Provide scientific data of known quality to support Agency decisions through partnerships with regional and national media program offices, state, local and tribal governments, academia, the private sector and the public.

Maintain a fully equipped laboratory to produce physical, chemical and biological data of known quality to be used for environmental decision-making at all levels of government.

Maintain and enhance a technically and scientifically skilled, dedicated and diverse staff through outstanding recruitment, career development, training, management and leadership.

Advance the Agency's science agenda at the point where decisions are made.

Introduction

History

The predecessor to the current Region 10 Laboratory was established by the Department of Health, Education and Welfare in 1961 to provide analytical support to the Columbia River Basin Project. The original laboratory was located in downtown Portland, Oregon. In 1964, the facility was transferred to the Department of Interior and renamed the Region 10 Federal Water Pollution Control Administration (FWPCA) Laboratory. Consistent with an evolving congressional emphasis on water quality, the Laboratory was renamed the Region 10 Federal Water Quality Administration (FWQA) Laboratory in about1969.

Responding to an emerging environmental crisis and public concern, President Nixon signed an executive order in 1970 bringing several federal environmental programs, including FWQA, under a single agency, the Environmental Protection Agency. Both EPA Region 10 Headquarters and the Laboratory, were moved to the Seattle area in 1971. Located in a temporary facility in Redmond, Washington, the Laboratory provided analytical support to EPA's Region 10 media programs.

Introduction

In the fall of 1974, the Laboratory moved to a second temporary facility on Seattle's downtown waterfront and remained there until a permanent facility was constructed on the Kitsap Peninsula near Manchester, Washington in 1979. During the 1970s and 1980s, as our understanding of the effects of environmental contamination grew, so too did the need for more complex and demanding analytical tools. The passage of RCRA in 1979 and especially Superfund in 1980 further accelerated the need to develop new analytical capabilities and capacity. In response to the need for a dramatic increase in analytical capacity to address site evaluation and cleanup, contract mechanisms such as the Contract Laboratory Program and the Environmental Services Assistance Team were established. The Manchester laboratory, in concert with other regional laboratories, played a vital role in establishing methods and quality assurance protocols for the routine analyses suitable for contract work. The more difficult analytical work requiring complex methods or the development of new methods remain the province of regional laboratories like Manchester.

The Laboratory continues to develop new technical capabilities and methods in response to the needs of evolving regional programs. The current Manchester Laboratory is state-of-the-art and one of the best staffed, best equipped and capable environmental laboratories in the country.

The Manchester Contribution

Sound science is critical to credible Agency decisions. The Laboratory is a vital element in a comprehensive science capability required by each region which includes project design, quality assurance, sample collection and other field functions, sample analysis, data interpretation and risk assessment. With this capability, the condition of the environment can be determined, potential remedies evaluated and the effectiveness of actions assessed. Without this capability, the Agency cannot know if its actions are protecting public health and the environment.

Like other regional laboratories, Manchester has developed an array of core capabilities, the most prominent being analytical support. This includes chemical analyses in a variety of matrices for metals, organic compounds, pesticides, various inorganic compounds and biological tests for microorganisms. While this capability is important to routine monitoring programs in support of regional program activities, it is vital to criminal investigations or sensitive enforcement activities, public health emergencies and special studies required by the Region. The regional laboratory is also viewed as a model for private and government environmental laboratories in the areas of analysis, waste management, pollution prevention, data systems, quality assurance, health and safety, environmental compliance and facility management.

In addition to analytical support, the Laboratory staff performs other scientific and technological functions integral to the Agency's mission. These activities include: expert witness testimony regarding analytical results and methods; method development; peer review; training to regional staff, other government agencies, tribes and private organizations; laboratory audits; responding to environmental emergencies; sample collection and transport; data analysis and evaluation; referee laboratory when another laboratory is experiencing quality assurance difficulties or is under investigation; and policy guidance and technical assistance to Headquarters, and other federal, state,

and local agencies regarding these activities. Besides obvious direct benefits, providing the core functions described above allows the Region to maintain the hands-on knowledge and expertise in laboratory science and technology vital to the credible conduct of our mission. For without the expertise necessary to prosecute these core functions, the Region and Agency would be unable to judge the quality of data and work products submitted by contract laboratories, industry and other members of the regulated community.

Complementing the core capabilities described above, each region has developed specialized expertise in response to some unique need of the region. These proficiencies, known as Centers of Applied Science, are for the most part state-of-the-art and often represent the best knowledge of the subject in the Agency and, in some cases, the nation. Region 10 has developed Centers of Applied Science in the areas of microbiology, trace metals analysis, PCB congeners analysis, fish tissue extraction and cleanup, X-ray diffractometry, polybrominated diphenyl ethers and pulp mill contaminants.

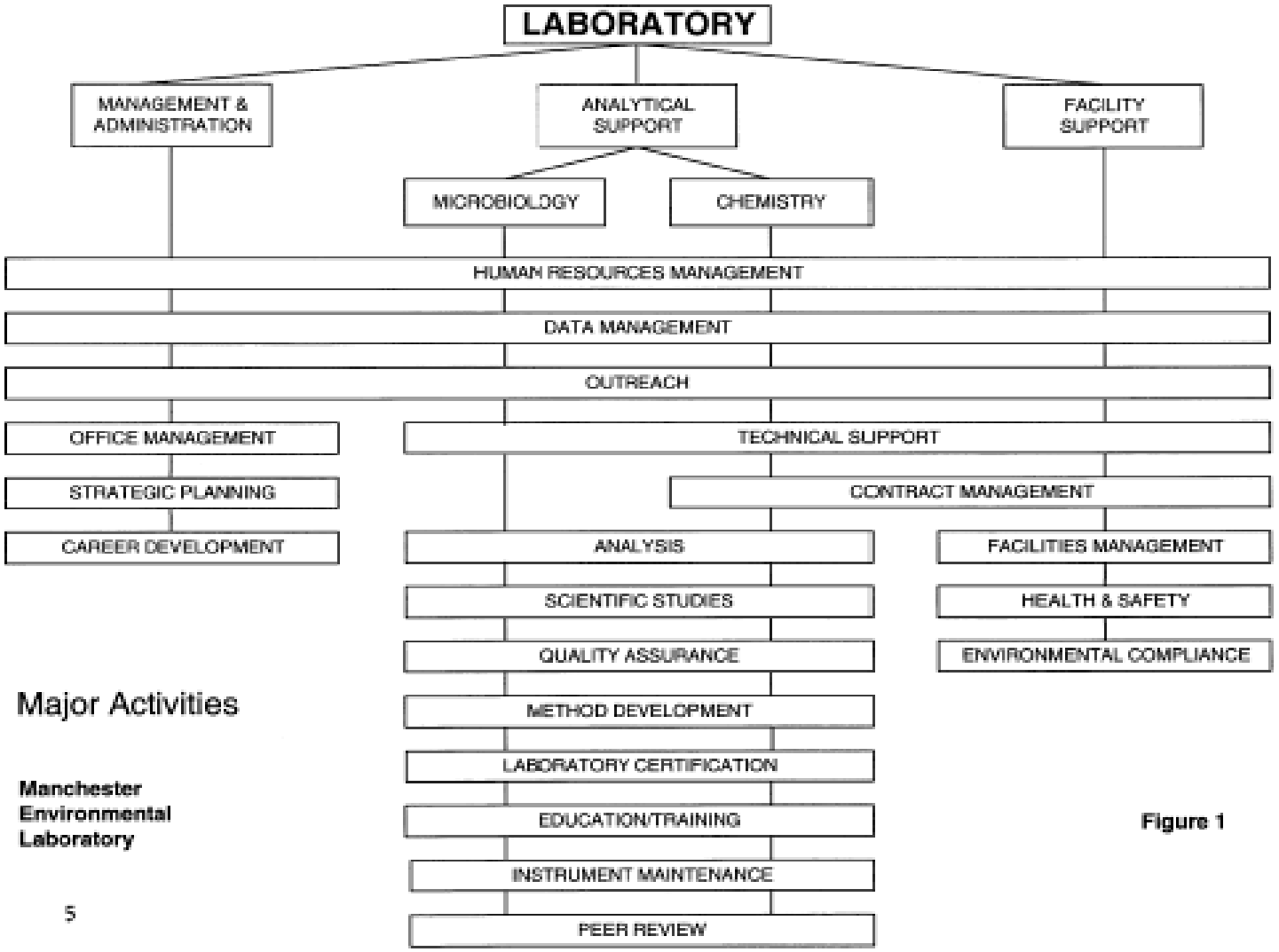
At Manchester, the predominant activities associated with day to day work are shown in Figure 1.

Organization

The Manchester Laboratory is administratively located in Region 10's Office of Environmental Assessment. Small disciplinary teams characterize the organization of the Laboratory. Teams responsible for environmental chemistry are supervised by the Manager of Environmental Chemistry. The Laboratory Director supervises all other Laboratory personnel and has overall responsibility for the facility.

Environmental Chemistry - Provides analytical and technical support in the area of chemical analysis, method development, contractor oversight, laboratory certification and data interpretation to virtually all environmental programs. This group is also responsible for certifying state drinking water laboratories for chemistry.

> Organics Team - The Organics Team is responsible for the analysis of volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), herbicides and other organic compounds in a variety of matrices.
>
> Metals Team - The Metals Team is responsible for the analysis of metals compounds in a variety of environmental matrices.
>
> Classicals Team - The Classicals Team is responsible for the analysis of a broad array of conventional or general chemical and physical parameters such as nutrients, minerals, flashpoint and Atteburg limits to name a few.



Major Activities

Manchester Environmental Laboratory

Figure 1

Environmental Microbiology Team - Provides method development, analytical and technical support in the area of microbiology. The program emphasizes the detection and control of pathogenic parasites (e.g. *giardia, cryptosporidium*) in drinking water. More recently, the team has also been active in the BEACHes Program and concentrated animal feeding operation compliance activities. The team is also responsible for certifying state drinking water laboratories for microbiology.

Facilities Management Team - Responsible for facilities management, laboratory modernization, employee health and safety, environmental compliance, a major portion of laboratory procurement and information technology (including LAN, LIMS and other computer applications).

Administrative Team - Responsible for administrative and clerical support to the entire laboratory.

Contract Support - 15 dedicated ESAT Superfund contract professionals (12 FTE) support environmental chemistry and other functions in the Region. The project officer for this function is stationed at the Laboratory. An additional 6.5 FTE of contractor support is managed at the laboratory to provide facility maintenance and janitorial services. The project officer for this function is stationed at Manchester as well.

Other Activities - A small contingent of field personnel are located at the facility. A geologist also spends about half time at the Laboratory performing analyses on an X-ray diffractometer, in support of Regional programs. These individuals are supervised by managers located in the Regional Office in Seattle.

State of Washington Department of Ecology - The Department of Ecology laboratory function is housed within the EPA Laboratory. An Interagency Agreement defines the terms of the laboratory sharing arrangement. Approximately 27 Ecology scientists and administrative staff provide a broad array of laboratory support to Ecology's environmental programs. Ecology operates its own equipment under its own management in space provided by EPA.

The organization of the Laboratory is captured in Figure 2.

Manchester Envrionmental Laboratory

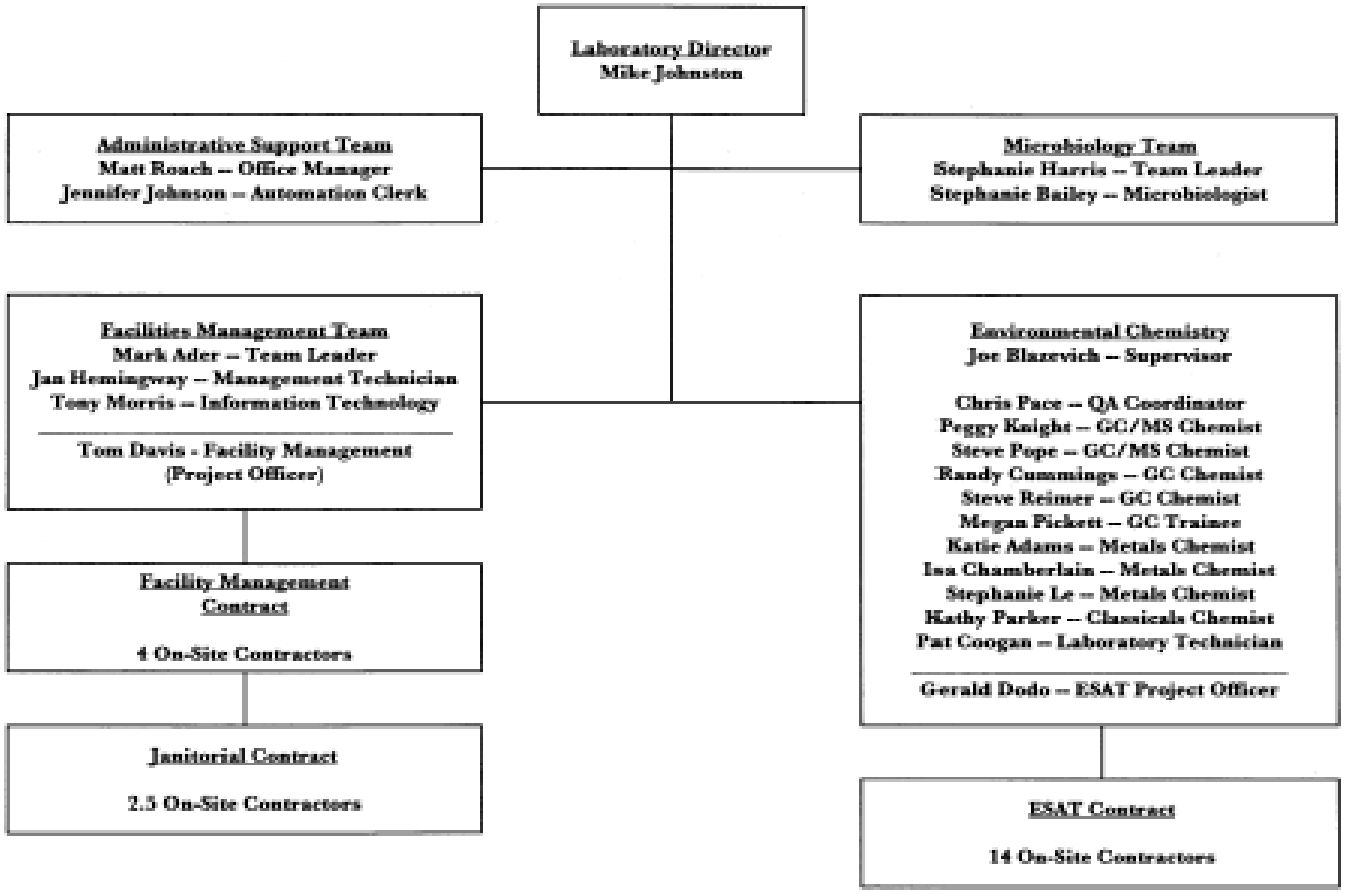


Figure 2

Analytical Report

The laboratory exists primarily to supply quality analytical data to regional programs in support of a broad range of regional initiatives from routine monitoring to criminal enforcement.

When reviewing the graphs that follow, these points should be considered:

★ Superfund appears to dominate the work of the Laboratory. There are 15 Environmental Services Assistance Team contractors devoted exclusively to the analysis of Superfund samples. EPA staff are responsible for all non-Superfund analysis, some Superfund analysis and all other functions such as laboratory certification, technical support and facility maintenance.

★ Counting analyses is not the best measure of analytical effort. Some analyses, such as a conductivity measurement, may take only a few minutes. Others, such as herbicides in an oily matrix, may take 8 to 10 hours to complete.

Analyses by Program (Program by Quarter)

The Laboratory performed 11,004 analyses in FY2003. Page 10 shows the number of analyses performed by program by quarter, shown on a logarithmic scale because of the greater number of samples analyzed for the Superfund program. Page 11 shows the same information on a linear scale.

Analyses by Media Program

Page 12 shows the relative utilization of Laboratory analytical capacity by media program.

Analyses by Program Function

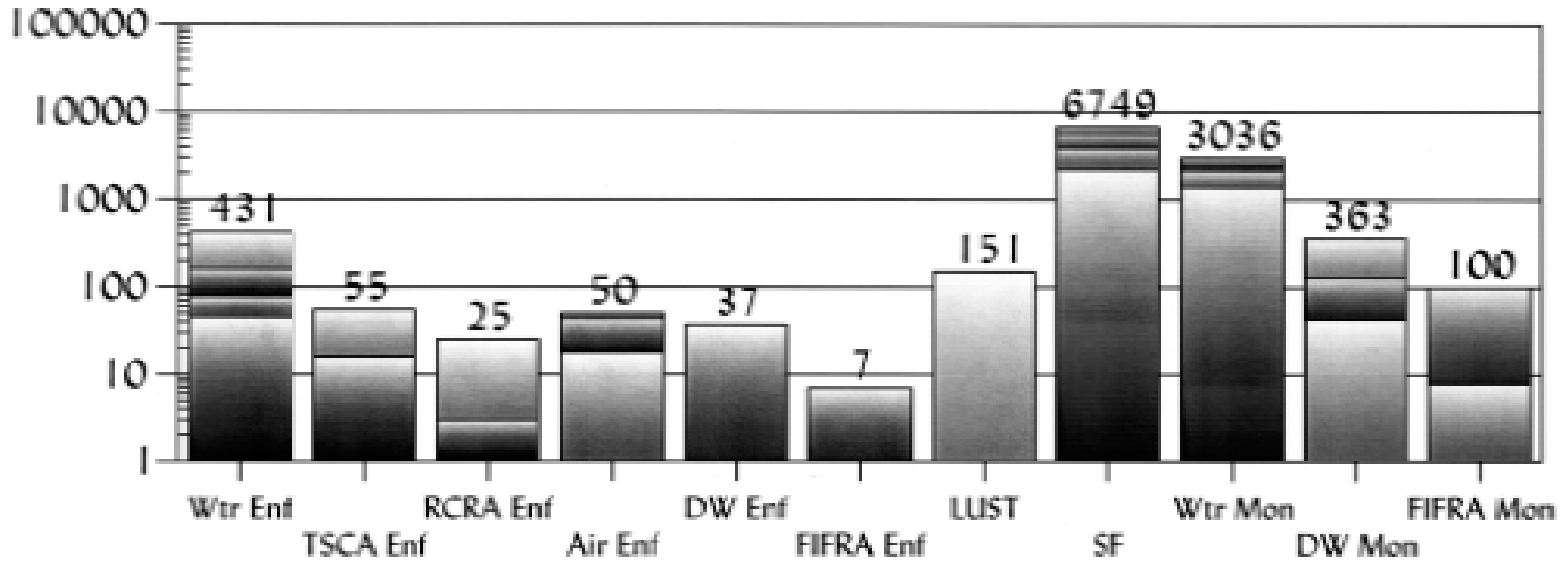
Page 13 illustrates the percentage of analyses performed by program function.

Analyses by Work Area

Page 14 identifies the percentage of analyses performed in each of the chemistry work areas.

Analyses by Program

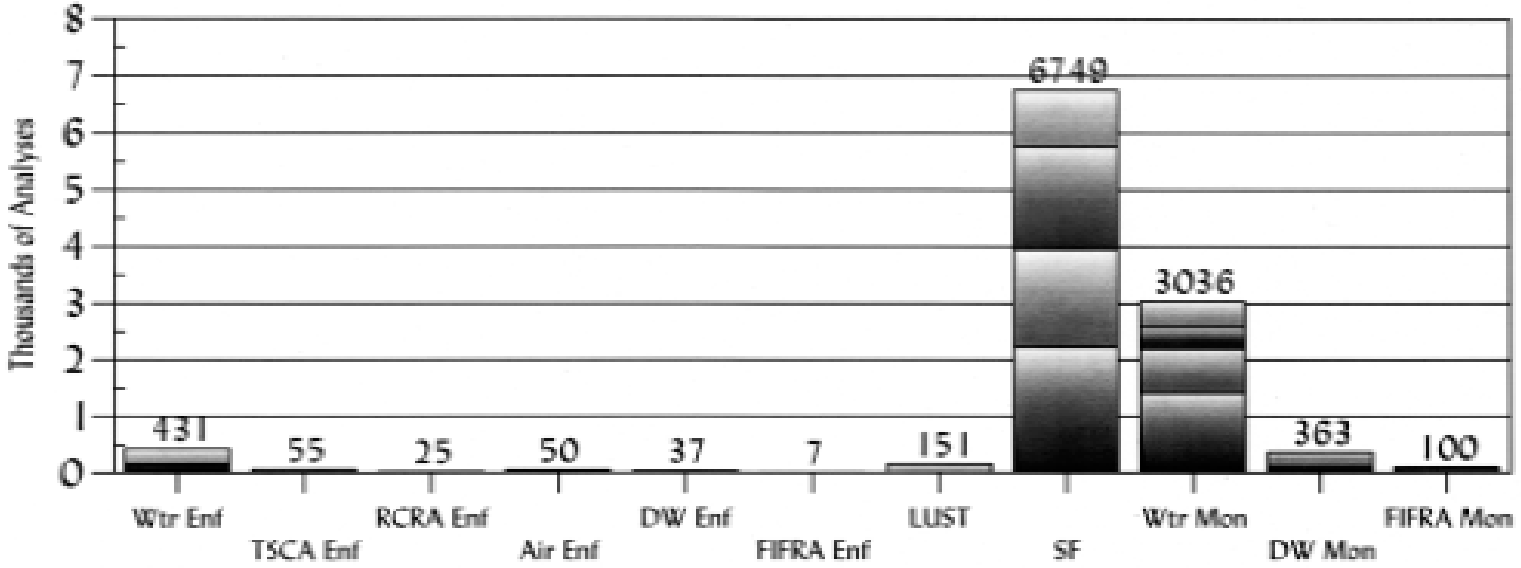
FY 2003



1st Q	46	16	3	0	0	0	0	2234	1422	0	0
2nd Q	32	0	0	18	0	0	0	1720	786	43	8
3rd Q	85	0	0	26	37	7	0	1814	372	87	92
4th Q	268	39	22	6	0	0	151	981	456	233	0

Analyses by Program

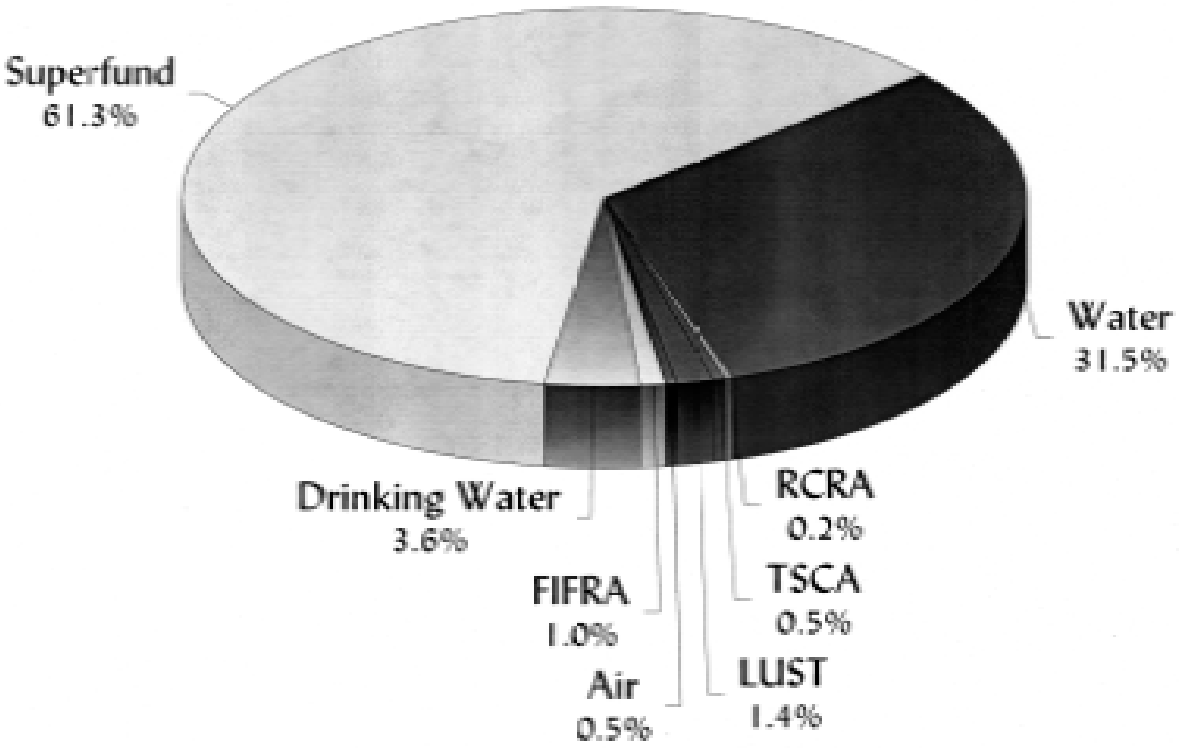
FY 2003



1st	46	16	3	0	0	0	0	2234	1422	0	0
2n	32	0	0	18	0	0	0	1720	786	43	8
3rd	85	0	0	26	37	7	0	1814	372	87	92
4th	268	39	22	6	0	0	151	981	456	233	0

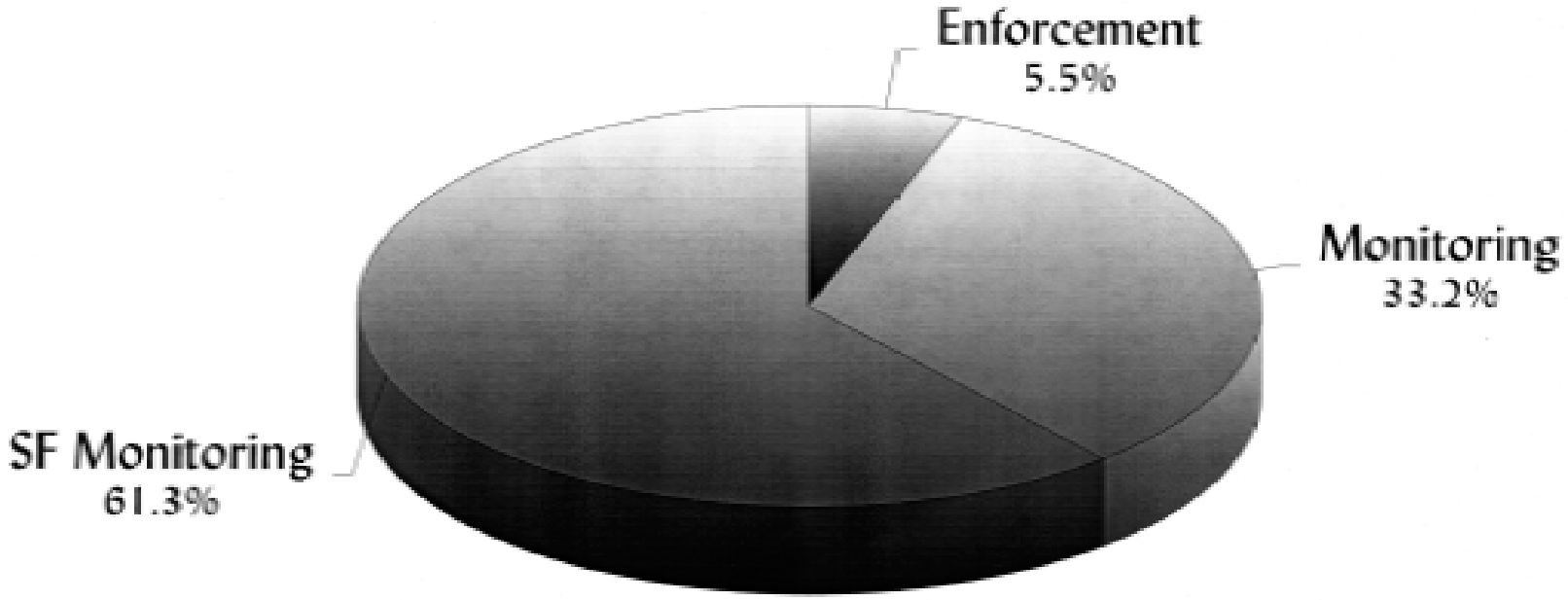
Analyses by Media Program

FY 2003



Analyses by Program Function

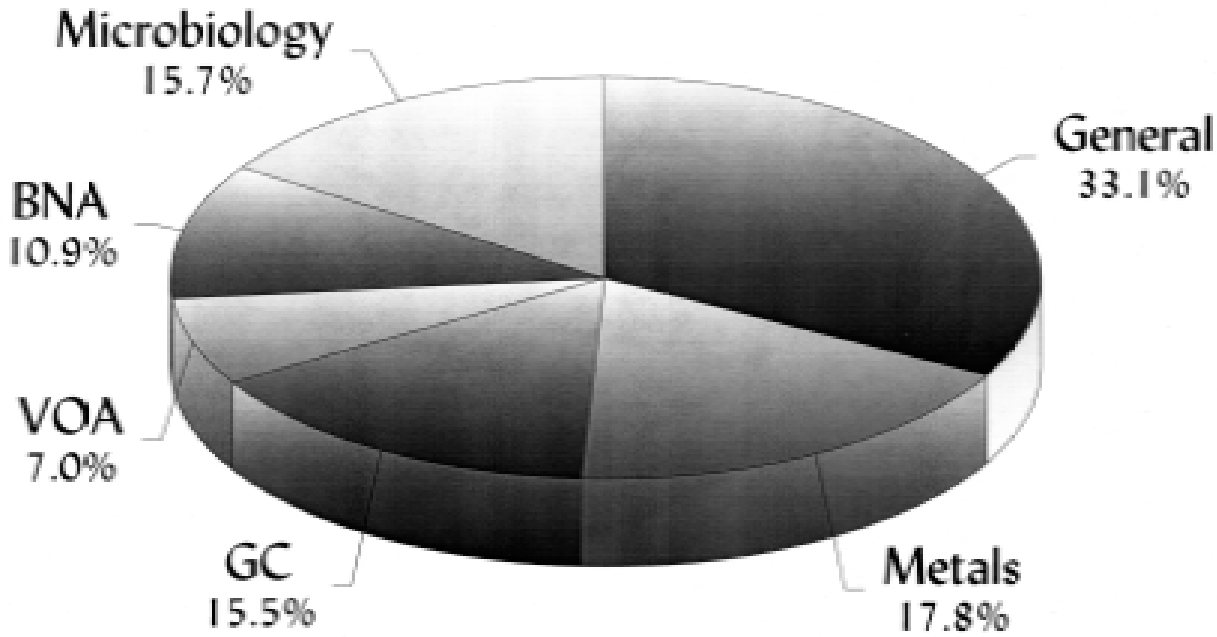
FY 2003



Total: 11004

Analyses by Work Area

FY 2003



Total: 11004

Centers of Applied Science

In addition to common core functions, regional laboratories have developed specific expertise in response to program needs unique to the particular region. In many cases, this represents the best knowledge of the discipline in the Agency, and perhaps the country. These unique regional laboratory capabilities reside in five Centers of Applied Science (CAS): Environmental Chemistry, Environmental Microbiology, Analytical Pollution Prevention, Ambient Air Monitoring and Environmental Biology. Complementing established capabilities in each Center are CAS projects being undertaken by the various regions intended to advance the state-of-the-art in environmental analysis, monitoring and pollution prevention. To maintain Center status for an **established** capability, a laboratory must have performed significant work in that area or conducted training within the previous year. To be considered a CAS **project**, the participating regional laboratory is committed to the preparation of an annual work plan describing the work of their discipline and an annual report describing the work's progress. Region 10's contribution to the Center of Applied Science annual report is contained in the Appendix.

★ **EPA Manchester Established Center Capabilities**
- ☆ Parasites in Drinking Water
- ☆ Fish Tissue Extraction and Cleanup
- ☆ PCB Congeners
- ☆ Low Level Metals Analysis
- ☆ X-ray Diffractometry
- ☆ Polybrominated Diphenyl Ethers
- ☆ Groundwater Under Direct Influence of Surface Waters

★ **EPA Manchester has developed CAS project plans for the following projects**:
- ☆ Polymerase Chair Reaction (Microbiology)
- ☆ X-ray Diffractometry
- ☆ Contaminants Generated By Modern Bleaching of Wood Pulp
- ☆ PBDE Congener Separation, Cleanup, and Analysis in Fish Tissue **(Project Completed)**

Technical Support/Peer Review

As part of its core function, the Laboratory provides technical support in the areas of environmental analysis; quality assurance; instrument calibration and repair; environmental compliance; health and safety; facility design and management; and pollution prevention. The Laboratory provided this support to EPA regional and national programs, EPA laboratories, other federal agencies, state programs and laboratories, local programs and laboratories, Tribes, the public, and industry. Some of the more noteworthy examples of assistance follow:

★ Technical support and peer review to EPA national and regional programs and laboratories, the programs and laboratories of other federal agencies, and international organizations:

- ☆ **EPA's Office of Research and Development** - Analytical and technical assistance to NHEERL/HSD in a three year project determining the effect of drinking water treatment changes on the environmental microbial ecology and human epidemiology. Other parties involved are ORD (NERL), and ORD (NRML), as well Seattle Public Utility and Centers for Disease Control. Our contribution includes sample collection and distribution, as well as analysis for *Giardia/Cryptosporidium* and heterotrophic plate count. The project was completed in December 2002 and a final report is being drafted by ORD personnel.
- ☆ **EPA/s Office of Air Quality Planning and Standards; Regions 5, 7, 8, 9, and 10; and Region 10 Tribal Organizations** - $PM_{2.5}$ air filter preparation and weighing support,
- ☆ **EPA's Office of Solid Waste** - Review of inorganic test methods,
- ☆ **USEPA Regions 1 and 8** - Analytical support for perchlorate analysis,
- ☆ **USEPA Region 1**- Assistance to analysts with mercury analysis,
- ☆ **USEPA Region 5** - Assistance to analysts with perchlorate analysis,
- ☆ **USEPA Region 9** - Assistance to analysts with ammonia analysis,
- ☆ **US Geological Survey** (USGS) - Ongoing analytical and technical support for water analyses for the Taku River project in cooperation with USGS and the Douglas Indian Association. The project is attempting to characterize the form of toxic metals in suspended sediment by mineralogical, metals and conventionals analysis in order to determine whether the source of elevated metals is from mining activities.
- ☆ **US Army Corps of Engineers and USGS** - Technical and analytical support in evaluating of a "bank filtered" water supply. Support will continue through the next year and will include Microscopic Particulate Analysis and *Giardia/Cryptosporidium* on four water systems.
- ☆ **Pan American Health Organization (PAHO)** - At the request of the Pan American Center for Sanitary Engineering and Environmental Sciences, a Manchester scientist taught courses in Trace Metals for Analysis in Water Samples in La Paz and Cochabamba, Bolivia to Bolivian scientists. These courses have been organized as part of a cooperative agreement between PAHO and the Proyecto de Medio Ambiente, Industria y Minería (PMAIM) to improve the quality of environmental analytical services, strengthening the capability of national laboratories in Bolivia.
- ☆ **PAHO (Lima, Peru)** - Provided technical assistance to on the purchase of an ICP/MS,
- ☆ **National University of Cochabamba, Bolivia** - Technical assistance on analytical methods and the development of a QA/QC protocol for soils analysis,
- ☆ **Glasson Potts Fowler Limited - England** - Technical assistance on the use of TCLP, or SPLP for the extraction of nitrogen species from crushed shells from shellfish processing.

★ Technical support and peer review to state, local and industry programs:

- ☆ **Hawaii Department of Health** - Through an interagency agreement (IAG) with the Kauai County Water and Honolulu Board of Water Supply, analytical and technical assistance in an evaluation of existing drinking water supplies. This evaluation will determine if the water sources are under the direct influence of surface water and therefore subject to the Surface Water Treatment Rule requirements,

Technical Support/Peer Review

- ☆ **Oregon DEQ** - Assistance to analysts to improve mercury analytical techniques,
- ☆ **Idaho Bureau of Labs** - Assistance to analysts to improve nitrate and fluoride tests,
- ☆ **Washington Department of Health** - Information and assistance on drafting a sample preservation policy letter for laboratories performing drinking water analysis,
- ☆ **Rhode Island Water Department** - Assistance to analysts with perchlorate analysis,
- ☆ **Honolulu Board of Water Supply** - Technical and analytical activities supporting the Unregulated Contaminate Monitoring Rule (UCMR). This IAG involves monitoring the filtered water systems for the presence of *Aeromonas* spp, using EPA Method 1605.
- ☆ **Pacific County Drinking Water Lab** - Assistance to analysts with nitrate analysis,
- ☆ **Seattle Post Intelligencer** - Provided information on the effectiveness, similarities and differences on the two RCRA Methods TCLP and SPLP,
- ☆ **Edge Analytical Laboratory** - Referee laboratory services between Edge Analyitcal Laboratory and Perkin Elmer relating to arsenic recoveries in atomic absorption analysis. Also, provided technical assistance and training to laboratory personnel to improve their analytical procedures for metals analyses by EPA Method 200.7 and EPA Method 200.8.
- ☆ **Water Management Laboratory** - On going technical assistance on establishing a Drinking Water approved procedure for the analysis of metals by graphite furnace (GFAA),
- ☆ **Florhanford lab** - Assistance to analysts with nitrate in soils analysis,
- ☆ **National Testing Labs** - Assistance to analysts with mercury analysis,
- ☆ **Pacific Northwest Laboratories - Battelle** - One day of on-site training for a laboratory chemist on instrumentation and procedures for analysis of arsenic species in fin fish and shellfish,
- ☆ **McClellan and Copenhagen** - Assistance to analysts with TOC analysis,
- ☆ **Friedman and Brooyay Lab** - Assistance to analysts with perchlorate analysis,
- ☆ **Murphy Engineers & Consultants, Inc. (Lancaster, PA)** - Information on SW-846 methods,
- ☆ **Cetac Technologies** - Assistance to analysts with mercury analysis,
- ☆ **DLH Environmental (Maryland)** - Assistance with ignitability and reactivity test methods,
- ☆ **Severn Trent Lab (Denver)** - Assistance to analysts with perchlorate analysis,
- ☆ **RFP-NIH** - Assistance to analysts with soil analysis,
- ☆ **Harera Environmental Lab** - Assistance to analysts with mercury analysis,
- ☆ **Oak Harbor Waste Water Treatment Lab** - Assistance to analysts with ammonia analysis,
- ☆ **Northern Testing Labs (Alaska)** - Assistance to analysts with BOD analysis,
- ☆ **Puget Sound Naval Shipyard Lab** - Assistance to analysts with cyanide analysis,
- ☆ **Pacific Water Technologies** - Assistance to analysts with perchlorate analysis.

★ Technical support and peer review to tribes:

- ☆ **Kivalina Village** - Provided technical and analytical support to an Alaskan Native Village concerned that its water supply might be contaminated by the Cominco Red Dog Mine,
- ☆ **Swinomish Tribe** - Analysis of 18 shellfish samples to determine arsenic concentration,
- ☆ **Shoalwater Tribe** - Assistance in developing the SOP for mercury analysis,
- ☆ **Yakama Tribe** - Support to the finie particulate monitoring program by providing and weighing $PM_{2.5}$ filters.

Special Studies

The Laboratory initiates or is asked to participate in studies that will improve a laboratory analytical or management capability. Some of the special studies conducted at Manchester during 2003 are included below:

★ Concerned about human exposure to pathogens at bathing beaches, Manchester initiated and conducted a study on recreational waters in Idaho. The purpose was to establish levels of *E. coli*, enterococci, *S. aureus* and fecal coliform bacteria in recreational waters , evaluate and compare various methodologies available for detection of these bacteria, and determine the feasibility of using the mobile microbiology laboratory in this kind of study. In addition, enterococci strains were evaluated for the presence of antibiotic resistance. This information will be provided in a report to the state of Idaho, specifically, the State Parks and Recreation Department and Idaho Bureau of Laboratories.

★ A report for the 2002 BEACHes project was completed and submitted to the Idaho Health Districts. A manuscript on the project was also submitted to the Journal of Environmental Health for publication.

★ Manchester microbiologists, in conjunction with Washington State Department of Ecology, supported a US Navy study designed to support TMDL development and result in a more environmentally protective strategy for managing pollutant sources in Sinclair and Dyes Inlets near Bremerton, Washington.

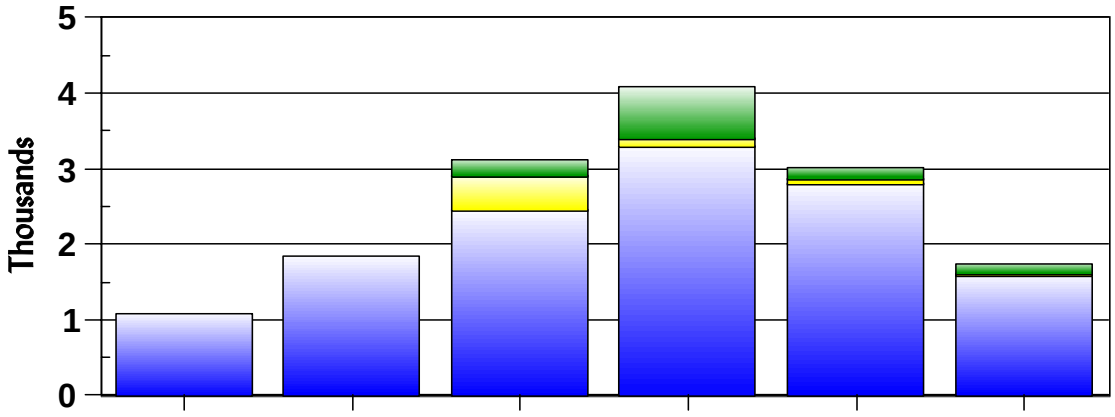
★ Constantly striving to improve the Agency's QA program, the Agency has adopted the policy of reporting results down to a minimum level of quantitation (ML), instead of the Method Detection Limit (MDL). A Special Report and Guidance on "Establishing a Laboratory Reporting Limit," was submitted by Manchester scientists to the Office of Water, interested EPA laboratories, other federal agencies and private laboratories and organizations describing a procedure for establishing a reporting limit (RL) that has a level of confidence in quantitation based on accuracy and precision rather than the Agency's ML which is based solely in precision.

★ A study of mercury contamination of six species of finned fish consumed by Asian Amercians in King County was formulated and executed with the assistance of an intern.

Field Analytical Activities

The benefits of moving laboratory analysis to the field are clear. Quicker turnaround time for sample processing, real-time interaction between the analyst and the field staff for problem resolution and data interpretation, and faster environmental decisions at the site. The graph on the following page shows the number of analyses performed in the field from 1998 to 2003.

Mobile Laboratory Analysis



	1998	1999	2000	2001	2002	2003
SF	1074	1844	2469	3311	2816	1600
CAFO			435	92	58	20
BEACH			216	690	136	114

SF analyses current as of March 31 of each year - FY1997 - 2002
SF analyses between 4/02 and 9/03 - FY03

Chemistry - A vibrant field capability has had particular relevance to Superfund cleanups. For several years the Region has possessed a significant field capability staffed by the ESAT contractor and used in support of the Superfund program. Over time, the level of support has grown from simple field tests to an impressive capability including GC parameters PAH, PCP, TPH-D, BTEX, chlorinated volatiles, freons, dinoseb, PCBs, chlorinated pesticides, herbicides, EDB and DBCP; hexavalent chrome; metals by AA and XRF; and general probe type parameters such as pH, DO and turbidity. Sampling capability includes soil, sediment and water for surface samples and subsurface samples by direct push technology (DPT).

DPT refers to a group of tools used for performing subsurface investigations by driving, pushing and/or vibrating small diameter hollow steel rods into the ground with sampling tools used for the collection of soil, ground water, and soil gas samples attached to the rods. A new Geoprobe unit acquired last year is also capable of drilling monitoring wells, an inherent part of any cleanup site with potential groundwater contamination issues. Using the two Geoprobe units, ESAT collected 651 samples and installed 25 monitoring wells between April 2002 and September 2003.

The Frontier Hard Chrome remediation made extensive use of our Geoprobe systems last year,

analyzing ground water just before reagent injection for hexavalent chromium contamination and then subsequent field sampling and on-site analysis of monitoring wells to track the effectiveness of the remedy. On-site testing for hexavalent chromium, dissolved oxygen and other water quality parameters will continue through the winter of 2004.

A multi-water quality parameter analyzer with flow cell technology was purchased this year and used extensively in support of the Frontier Hard Chrome site. The instrument simultaneously measures pH, ORP, DO, temperature, conductivity, and turbidity while groundwaters are being drawn from wells thus protecting the data from the effects from ambient air, temperature, and storage in general.

Microbiology - Mobile microbiology laboratory support was provided to inspectors investigating small municipal waste water treatment plants for permit compliance. Use of the mobile laboratory enabled the inspectors were able to meet the 8 hour holding time required for coliform analysis, a limiting issue in past inspections.

The microbiology team provided analytical support for inspectors conducting inspections at 6 minor municipal POTW in Northwestern Idaho. The team also conducted sanitary surveys and collected water samples at 12 recreational sites in the central and eastern portion of Idaho. Multiple samples were collected at each site, the number dependant upon population of swimmers at the time of the inspection and the risk associated with the site based upon the sanitary survey results.

Quality Assurance

Many important environmental decisions are based in major part on laboratory data. If data are not of requisite quality, then decisions may be incorrect, resulting in unacceptable risk to human health and/or the environment. It is the policy of the EPA Region 10 Manchester Laboratory that Quality Assurance (QA) shall be maintained at a level that will ensure that all environmental data generated and processed is scientifically valid, of known precision and accuracy, of acceptable completeness, representativeness, and comparability, and where appropriate, legally defensible. Continuing checks of the overall quality system were evident this past year:

★ The EPA Region 10 Manchester Laboratory annual internal audits were held in October and November of 2002 with follow-up audits in the spring of 2003. The audits were performed by laboratory analysts in areas outside their particular expertise and focused on documentation.

★ The Regional Quality Staff conducted a Quality Systems Review (QSR) in July of 2003. The QSR examined the implementation of the EPA Region 10 Manchester Laboratory and the Environmental Services Assistance Team (ESAT) contractor's quality system and quality

assurance/quality control activities. The Laboratory responded to the findings and observations in a timely fashion. No major issues of concern were noted in the QSR report.

★ An on-site evaluation of the EPA Region 10 Manchester Laboratory was conducted by EPA Cincinnati in September of 2003 to certify the Laboratory's capability to perform analyses in compliance with the Safe Drinking Water Act (SDWA). In the final report, the on-site evaluation team, complimented the excellence of the Laboratory staff and facility.

The laboratory maintained certification for the following drinking water parameters:

☆EDB/DBCP by 504.1	☆Pesticides by 505	☆Herbicides by 515.3
☆Volatiles by 524.2	☆Semivolatiles by 525.2	☆Carbamates by 531.2
☆Glyphosate by 547	☆Diquat by 549.2	☆Haloacetic acids by 552.2
☆Metals by 200.8	☆Mercury by 245.1	☆Fluoride by 300.0
☆Cyanide by 335.4	☆Nitrate/Nitrite by 353.2	☆Total Coliform
☆Fecal Coliform	☆*E. Coli*	☆Heterotrophic Plate Count

★ The EPA Region 10 Manchester Laboratory participated in ten performance testing studies in FY2003. The studies included organic, inorganic, and microbiological methodologies. Matrices included drinking water, waste water, and soil. A total of 384 analytes were evaluated with 97% being rated "acceptable" with no false negative results. Nearly one half of the "non-acceptable" results were due the Laboratory reporting detected analytes at very low levels in a soil performance testing study while the study provider reported these analytes as "0", as required by National Environmental Laboratory Accreditation Conference (NELAC).

★ The EPA Region 10 Manchester Laboratory participated in nine performance testing studies in FY2003. The studies included organic, inorganic, and microbiological methodologies. Matrices included drinking water, waste water, and soil. A total of 316 analytes were evaluated with 97% being rated "acceptable" with no false negative results.

Individual PT results were as follow (number of data points are in parenthesis):

☆WS78 - Inorganics (9) - 100%	☆WS80 - Organics/Inorganics (79) - 97%
☆WS81 - Inorganics (20) - 100%	☆WS82 - Organics (20) - 100%
☆WS83 - Organics (2)* - 0%	☆WS85 - Organics (2) - 100%
☆Soil40 - Organics/Inorganics (168) - 95%	☆WP98 - Inorganics (8) - 100%
☆WSmicro (8) - 100%	

* An error occurred during the sample preparation of PT WS83, EDB/DBCP by 504.1, resulting in "not acceptable" ratings. Corrective action was taken and EDB/DBCP results were rated "acceptable" during PT WS85.

Method Development

The business of environmental analysis is constantly changing. As we learn more about the effects of certain compounds on public health and the environment, lower detection limits are needed. The presence of new chemicals in the environment require new analytical methods to detect and measure them. New methods requiring the use of less sample, solvents and reagents are also being sought in the name of pollution prevention. Manchester was involved in the following method development efforts during the past year:

- ★ **Polymerase Chain Reaction** - Progress continues on development of a real-time PCR method for detection of Cyclospora. ORD (Cincinnati) will provide flow-cytometer counted oocysts to aide us in determining the method detection limit. Efforts to develop a technique to simultaneously filter the sample and filter Cyclospora DNA from spiked matrix samples containing algae and other contaminants, while successful in reagent water, were not successful in environmental samples. A commercially available DNA purification kit is under evaluation.
- ★ **Mineralogical Analysis** - **Mineralogical Analysis** - Evaluation of using portable X-ray fluorescence information to enhance X-ray diffraction analysis continues. Portable XRF allows a screen for samples or sample components that contain a particular metal of interest. XRF also provides a verification on the correct chemical identity of major phases. If successful, incorporation of XRF measurements with XRD should lead both to a time savings and a check on accuracy.
- ★ In conjunction with NEIC, Manchester is further developing XRD Method 6300 for inclusion in SW-846, EPA's principal compendium of environmental analytical tests.
- ★ **Arsenic Speciation** - Arsenic toxicity varies with the form of the arsenic being consumed. Some populations in Region 10 may have high exposures to the particularly toxic forms of inorganic arsenic, dimethyl arsenite (DMA) and monomethyl arsenate (MMA), due to high seafood consumption rates. A lack of information on speciated arsenic concentrations in fish, shellfish and seaweed, results in a high level of uncertainty in characterizing the associated risk. Scientists from NERL-Cincinnati and Manchester developed a method to distinguish arsenic species in these sea foods. The Manchester laboratory has now the capability to perform this analysis and will explore including incorporation of the method into various method compendia (SW-846, Office of Water).
- ★ **Lipid Analysis** - Technique was developed and implemented a stand alone method for the determination of nonpolar lipids in fish. This method replaces an outdated and laborious grinding and extraction method with a simple and automated one that uses less than 10% of the solvent and 20% of the labor.
- ★ **Bunker Hill Biomonitoring** - In a joint project with the U.S Fish and Wildlife Service, the Manchester Laboratory is working on a multi-year project to analyze metals contamination in small mammals in the Bunker Hill area to assess the extent to which contamination is impacting the wildlife food chain. The large number and variety of samples, including whole body animals as well as individual organs, scat and blood samples, has required the development of new methods for sample preparation and analysis.

Laboratory Certification, Capacity Building, Training

An important function of the Laboratory is to share knowledge of laboratory methods and practices. While laboratory certification is a regulatory function, Manchester also uses it as a training venue for developing and improving the capabilities of the laboratory being audited. The success of this philosophy is demonstrated by the success of Region 10 states and some tribes in achieving certification under the drinking water program. This success is due in no small part to the fact that the Region 10 Laboratory is fully certified for nearly all regulated and unregulated chemistry and microbiology parameters. Our commitment to maintaining certification lends credibility to Region 10's program, helps the Region as a technical resource and has QA ramifications that are transferrable to other programs.

- ★ Comprehensive Drinking Water Laboratory Certification Audits were performed at the following state primacy laboratories:
  - ☆ Oregon State Public Health Laboratory (microbiology),
  - ☆ Oregon Department of Agriculture (microbiology and organics),
  - ☆ Oregon Department of Environmental Quality (metals),
  - ☆ Shoalwater Tribal Laboratory (metals),
  - ☆ Water Management Laboratories (State of Washington - metals),
  - ☆ Edge Analytical Laboratory (State of Washington - metals).
- ★ At the request of the EPA Office of Ground Water and Drinking Water, Manchester scientists taught the sections on Metals and Microbiology Analytical Methods at the June 2003 Drinking Water Laboratory Certification Officers Training Course held periodically in Cincinnati, Ohio. Instruction included a mock audit to evaluate the students' expertise in auditing.
- ★ A one-day training course to Region 10 state certification officers was conducted at Manchester.
- ★ The State of Washington has opted to use two private laboratories to serve as their state primacy laboratories under the Safe Drinking Water Act. Manchester scientists have invested prodigious amounts of time helping the laboratories in question conform to the rigorous requirements necessary for certification and interpreting regulations and guidance for relevant state agencies.
- ★ An audit of Fort Lewis' Water Microbiology and Chemistry Laboratory was performed in conjunction with an NPDES permit inspection. The EPA inspector was provided with information regarding acceptable practices for microbiological and chemical analysis of waste waters.
- ★ Instructed analysts with the County of Maui Water Supply Laboratory in proper techniques for "Method 1623: Detection of Giardia/Cryptopsporidium in Drinking Water Using Filtration/IMS/FA."
- ★ Two chemists from Edge Analytical Laboratories were trained on EPA Method 200.7 metals by ICP/MS.

Support to the Criminal Program

★ A Manchester scientist provided an expert witness report and testimony in a federal hearing, U.S. vs Portland Meadows, Inc, which resulted in fines against the defendant for violations of the Clean Water Act. This criminal enforcement action was follow up to a report provided to the Office of General Counsel that confirmed that direct/indirect contact with water contaminated by fecal material from horses can pose a public health risk.

★ The Don Herron case was settled with the accused agreeing to 3 years probation and 6 months home confinement. Laboratory data was essential to the prosecution's case and several Manchester scientists were scheduled to testify.

Assistance to Headquarters Programs

Because much of the Agency's technical knowledge of laboratory science is located in the regional laboratories, we are occasionally asked to provide assistance to Headquarters programs to assist in method development, Headquarters-initiated special studies and other technical areas. Assistance to Headquarters programs by regional laboratory scientists included:

★ Assisted in the writing of the 5th edition of the EPA Manual for the Certification of Laboratories Analyzing Drinking Water: Criteria and Procedures Quality Assurance, Chapter 5 (Microbiology)
★ Continued to provide technical assistance to Office of Water (HQ) and Technical Support Center (Cincinnati) on the design and implementation of a laboratory approval program for *Cryptosporidium* detection in drinking water. The laboratory approval program will support the Long Term Interim Enhanced SWTR (LT - 2). This regulation will affect all surface water systems with greater than 10,000 hookups.
★ Provided technical assistance in drafting and reviewing the "Implementation Guidance for Ambient Water Quality Criteria for Bacteria." This document will aid state and tribal health authorities in properly designing and implementing their recreational water criteria under the BEACHes regulation.
★ Regional laboratory scientists participated in both the Office of Solid Waste's Organic Methods workgroup and Inorganic Methods workgroup. This activity includes peer review of methods and supporting documentation for inclusion in SW846. One of the more noteworthy accomplishments last year was the completion of Method 8000C, Determinative Chromatographic Separations. This provides the overall guidance for most organic analytical methods and includes minimum quality control criteria and non-method specific requirements.
★ Through the ESAT contract and the microbalance facility at Manchester, provided $PM_{2.5}$ filter weighing support to the western regions for fine particulate monitoring.

Outreach

The Laboratory is a remote facility. In addition to fielding calls on seemingly every environmental issue imaginable, and tours of the facility, the staff is asked from time to time to provide assistance to professional and community activities. This year, the Laboratory provided support as follows:

★ Manchester scientists made presentations at the Kitsap County Water Festival, an outreach program for 4th grade students sponsored by the county. This year's effort included a presentation and then the involvement of students in testing clean and contaminated water. The Festival educates students on the importance of clean water to the health of the environment.

★ Several Manchester laboratory scientists helped organize, served as moderators for and made presentations at the 2003 Summer Meeting of the Northwest Chapter of AOAC International, the preeminent professional organization for analytical chemists in the Northwest. A Manchester scientist moderated a discussion on tuning criteria for GC/MS. Two Manchester scientists also conducted a training session on PCB analysis.

★ The following technical papers were presented at the EPA 2003 LTIG (Laboratory Technology Information Group) Conference in Houston, Texas:
- ☆ Content and Layout of the LTIG intranet website,
- ☆ A Feasibility Study of Water Extraction of VOCs in Soil.

★ Manchester scientists were invited to make presentations at various fora. The following presentations were made in 2003:
- ☆ "PCR - What the Heck?" at the Region 10/ORD Emerging Issues Seminar.
- ☆ "Genetics 101: or the Secret of Life" as a presentation in the Regional Education Series.
- ☆ "Two new Methods: mColiBlue 24 and Nutrient Agar with MUG"; "Microbiology Laboratory Quality Assurance"; and " Presence/Absence broth for Detection of total coliform and fecal coliform/ *E. coli*" at the Drinking Water Certification Training Course in Cincinnati, OH.

★ Instruction in chemical testing was provided to 3 science classes at John Sedgwick Junior High School.

★ Web access to Laboratory work can be found at:
- ☆ Laboratory homepage
  http://yosemite.epa.gov/R10/LAB.NSF/0/5B0CD7A249667AAE882565E10067485B?OpenDocument
- ☆ Mineralogical reports
  http://yosemite.epa.gov/R10/OEA.NSF/webpage/Mineralogical+Reports

Environmental Management

As a full service environmental laboratory, Manchester must comply with the very laws EPA is charged with enforcing such as hazardous waste disposal. Further, the laboratory is attempting to reduce its use of resources such as energy and water. Activities that have dominated these efforts over the past year include:

★ Laboratory staff processed and completed 3 hazardous waste disposal shipments totaling 5,283 pounds at a cost of $16,359.

★ The aggressive Manchester recycling program continued to recycle glass solvent and acid bottles; clean glass and HDPE plastic sample bottles; glass and plastic beverage bottles; aluminum tins and foil; steel and tin cans; paper; and cardboard.

★ Progress continues on the design of a comprehensive Environmental Management System for activities performed at the facility. During the past year, the EMS team identified the facility's significant environmental aspects, identified targets and objectives to achieve environmental improvements for those aspects, and developed twelve Environmental Programs and Operational Controls for the significant environmental aspects. The team also identified roles and responsibilities for it's employees and began writing the EMS Manual. The staff was trained in the EMS system, pollution prevention and was enlisted to find ways to reduce our resource footprint.

★ To reduce power usage, autoclaves are now manually activated (when needed) as opposed to the unit automatically turning itself on and off at the beginning and end of each work day. The microbiology section no longer keeps the water baths running continuously, turning them on only when testing is in progress.

★ The laboratory continued to recycle methylene chloride. Recycling methylene chloride reduced the number of new cases purchased and consumes several gallons of the hazardous waste that would otherwise have to be disposed of by the laboratory. In FY 2003, 12 cases of recycled solvent were used resulting in avoided purchase costs of $1,100 and avoided waste disposal costs of approximately $390. Because recycled solvent frequently fails to meet the necessary quality standards and is personnel intensive, our solvent recycling program is not cost effective and we have decided to suspend it for the foreseeable future.

★ An Horizon Dry Disk system was purchased this year for the drying of organic extracts using solid phase type disks. This system is expected to remove the need for using drying agents such as sodium sulfate to dry extracts, thus reducing solid wastes from the laboratory. Experiments are currently being conducted to test the technology for use in trace organic compound analyses.

Health and Safety

The health of Laboratory staff is the most important management imperative. The extensive use of glassware, solvents (some of which are suspected carcinogens), compressed gases and potential exposure to contaminated environmental samples all conspire to make laboratories inherently more risky than office environments. Manchester has invested heavily in its health program and enjoys an excellent safety record. Health and safety highlights from the last year include:

★ There were no accidents, injuries or spills involving EPA staff in FY 2003.

★ All staff EPA, Ecology and ESAT, completed the required 8-hour laboratory safety refresher training.

★ A comprehensive, three-day health and safety and environmental compliance audit was conducted by Headquarters Safety, Health Environmental Management Program (SHEMP) staff. The audit revealed a few minor findings but the audit team complimented Manchester on having an excellent program, one of the best in the Agency.

★ An automated external defibrillator (AED) program was established at Manchester with several staff members trained in the use of the device.

★ Four Laboratory Safety and Health Committee meetings were held in FY 2003.

★ Laboratory Safety and Health Committee members completed the annual safety inspection in June.

★ Kitsap County Fire Department completed the annual fire safety inspection finding no significant problems.

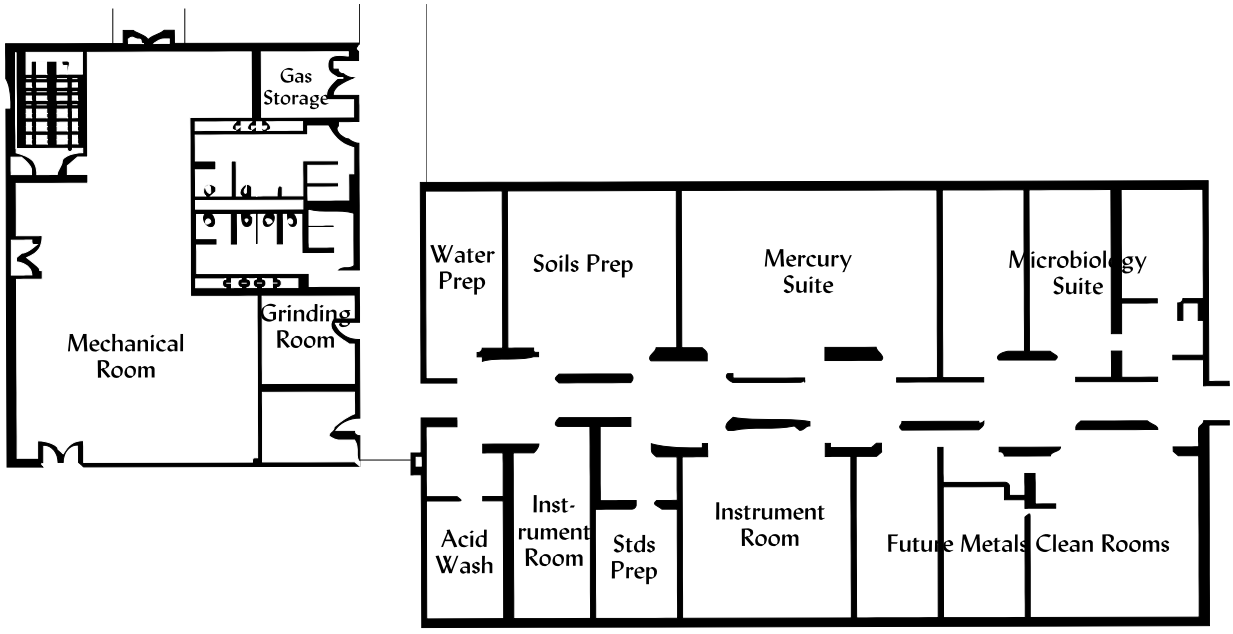
★ A radiation safety training class was taught by the Radiation Safety Officer this year to EPA and contractor staff. Basic radiation safety issues and Manchester Laboratory specific requirements were covered.

Facilities Management

The Laboratory is a complex and aging facility housing more people and more functions than it was originally designed for. Designed as a water testing laboratory to accommodate 40 individuals, the Laboratory has expanded to include several other disciplines and supports a combined EPA, contract and Department of Ecology staff of over 70. Despite its age, the Laboratory continues to provide outstanding support to regional and national programs. Laboratory modernization was a focus of the facilities staff in FY 2003:

Facilities Management

★ A new 7,000 ft^2 metals/microbiology wing and a 3,400 ft^2 mechanical room expansion was occupied in March of 2003. The new wing provides improved facilities for metals analysis and a new microbiology clean room suite for DNA work. Minimizing the use of metal in the metals suites has significantly reduced blank contamination with concomitant improvements in accuracy and detection limits. Due to budget limitations, the complexity of laboratory construction and rigorous program demands that require ambitious engineering solutions, the metals clean room suite was not completed during this construction period. Hopefully, metals clean room design and construction will follow shortly after Phase II is completed. The floor plan for the new wing is shown below:



★ Design for the renovation of the existing laboratory (Phase II) began. Phase II of the Laboratory's modernization program will be completed in multiple stages over the next few years and include modernization of the ventilation systems, mechanical systems and replacement of all fume hoods and case work in the existing wings. When completed, the existing laboratories will be as safe and energy efficient as the new wing.

★ Installation of a new security and fire alarm system was completed in March 2003.

★ The exteriors of all the wood sided buildings were painted this past summer.

★ Tubes in the boilers in the main laboratory were replaced.

Information Technology

The Laboratory exists to generate data. Information systems are critical to the collection, management and presentation of that data. Information systems are also required for communication, administrative processes and management systems. In addition to the regional LAN, the Laboratory uses a Laboratory Information Management System (LIMS) to manage laboratory data. In some cases, work areas in the laboratory have their own system that processes information before transfer to the LIMS. Customized software must frequently be written for virtually all systems at the Laboratory. Information technology highlights include:

★ The current LIMS system is over 10 years old and approaching obsolescence. Inasmuch as commercially available LIMS would not work at Manchester without major changes to laboratory processes, the Laboratory's IT professional is designing and implementing a modern LIMS system using an Oracle data base and Delphi/other interface. Progress to date includes:
  - ☆ A replacement for the main Labstar data management application was developed and has been going through informal testing. The new application will permit a migration of functions performed by the old Labstar to the new LIMS database. As this is the oldest legacy application it is the most likely to be incompatible with new technology.
  - ☆ Significant changes were made to the LIMS database design in the area of sample login/assignment. This is a challenging area of LIMS and will probably require further refinement to make it work well.

★ Eight computer systems were procured, configured and installed. This included the upgrade of 4 systems in the classical chemistry area, 1 additional data processing system for the LECO TOF, 1 database development server running Oracle and 2 new airlab systems. Two aging GC/MS data stations were also retired by installing new monitors and software on existing desktop systems. 4 new laser printers were also procured/installed in various lab areas.

★ The Lab Purchasing System was expanded to include all OEA bankcard holders (currently 22). Now all of OEA is using the central electronic bankcard log system for all small purchases.

SALARIES	$1,876,926
OPERATIONAL COSTS (Regional Funding)	
Facility Maintenance Contract	$238,424
Janitorial Contract	$177,522
Security Equipment and Services	$3,251
Facility Miscellaneous Supplies, Equipment & Repairs	$249,130
Utilities: Electricity, Water, Sewer, Garbage, Fuel, Propane, Phone	$290,025
Instrument Service Contracts/Repairs	$142,297
Lab Supplies: Compressed Gases, Chemicals, Analytical, Office, H&S	$172,397
Training	$1,519✧
Travel*	$20,155*
Hazardous Waste Disposal	$16,359
Capital Equipment	$463,695
Other Equipment: ADP, Office	$2,051
Regional Buy-in to ESAT for Data Entry Support	$18,000
Regional Buy-in to ESAT for Tribal $PM_{2.5}$ Support	$5,530
TOTAL OPERATION COSTS (REGION)	$3,677,281
INFRASTRUCTURE AND SERVICES (HQ FUNDING)	
Security Guard	$172,000
Environmental Services Assistance Team (ESAT) Contract	$994,040
National Buy-in to the ESAT Contract for Western States PM2.5 Support	$217,778
TOTAL INFRASTRUCTURE AND SERVICES (HQ)	$5,061,099
(ECOLOGY PRO-RATA SHARE)	($330,300)
GRAND TOTAL	$4,730,799

✧ $1,301 funded from other sources

* $1,372 funded from other sources

Historical Information

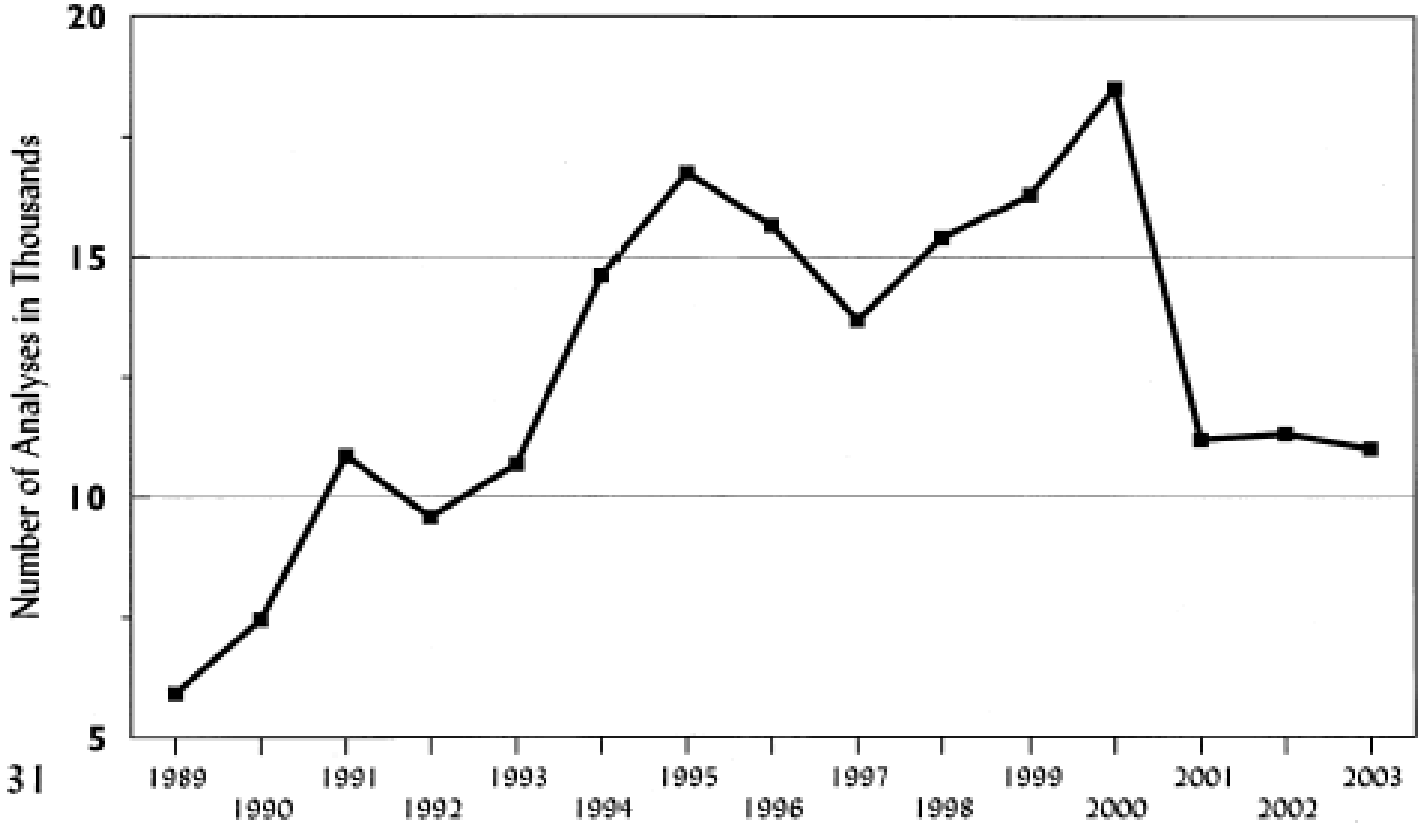
EPA staff is responsible for non-Superfund sample analysis, some limited Superfund analysis, external laboratory activities such as laboratory certification and outreach, and all infrastructure functions supporting the entire Laboratory. The ESAT contract directs a significant analytical capability at a voluminous Superfund sample load. The graphs that follow illustrate how laboratory staffing and analytical throughput have changed over time. While it would seem logical to attempt to correlate sample throughput with staffing levels, such correlation is difficult at best. In the past, for example, ESAT has also performed other functions such as the preparation of performance evaluation samples for the microbiology portion of the Drinking Water Information Collection Rule. This function added 6 FTE to the total laboratory work force but resulted in no sample analyses that would be counted in any tabulation of analytical throughput. Further, analyses are not the same. Some analyses take much longer than others and the graphs of analytical throughput make no attempt to normalize on that basis.

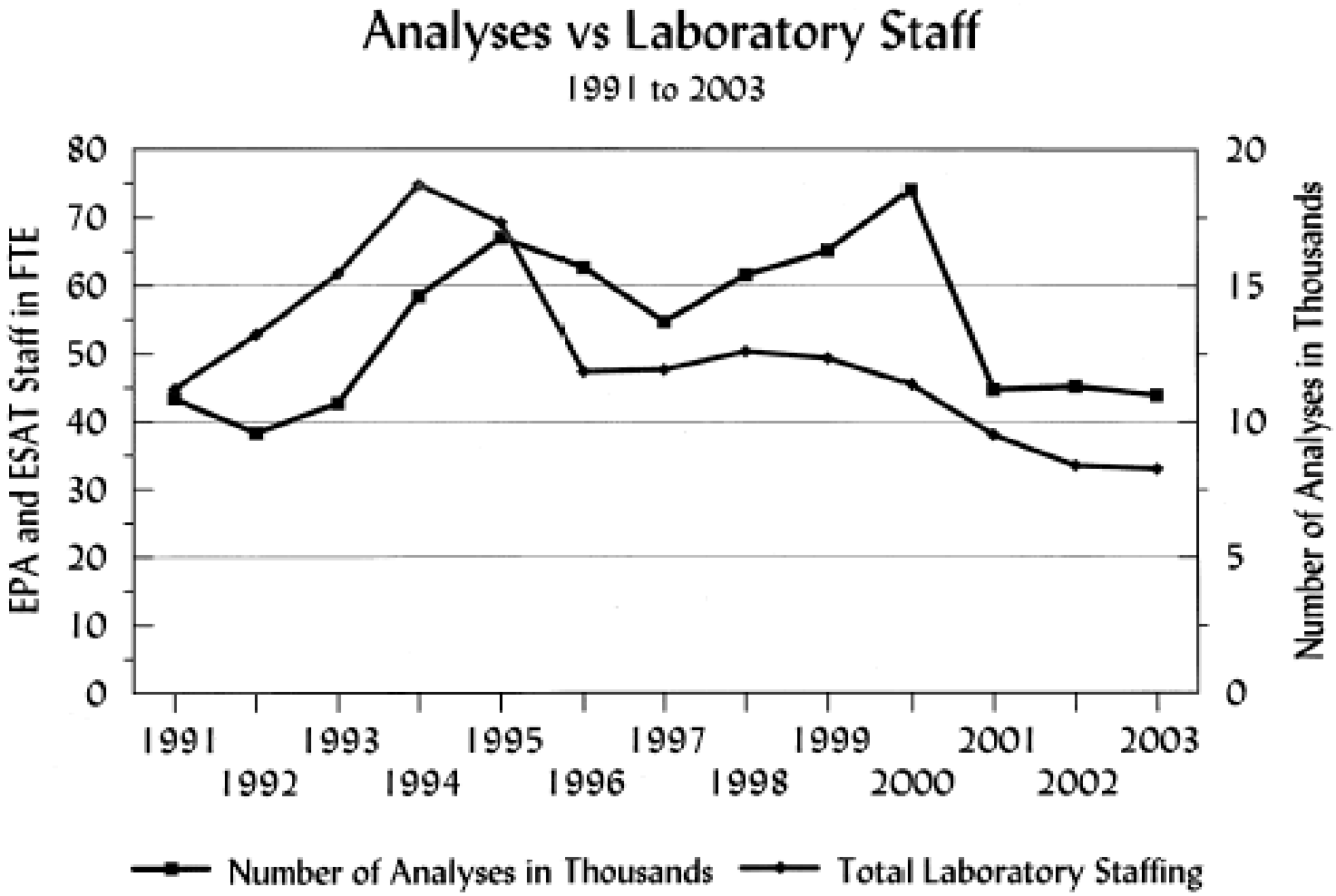
Although correlations between sample throughput and staffing should be made very cautiously, the graph on page 32, Analyses vs Laboratory Staffing, shows that analytical throughput and staffing appeared to correlate fairly well from 1991 to 1995. The divergence between the two plots from 1997 to 2000 suggests that the laboratory is becoming more efficient at processing environmental samples. The drop in 2001 and 2002 is probably largely the result of dramatic reductions in the ESAT contract of April 2001, just before the busy field and analytical season. From 2001 to 2003, laboratory throughput remained essentially constant despite the departure last year of a very senior and very productive analyst who was replaced by a promising trainee. This level of throughput again intimates improvements in productivity through improved analytical processes and instrumentation.

The graph on page 33 illuminates an emerging concern. Budget stresses are forcing a reduction in contractor staffing levels at a time when senior scientists are retiring. Agency credibility hinges predominantly on good, objective science. Only with a cadre of knowledgeable, committed scientists can such science be assured. If EPA is to remain relevant, it is essential that the Region and the Agency insure that EPA science staffing levels remain constant, or better, increase.

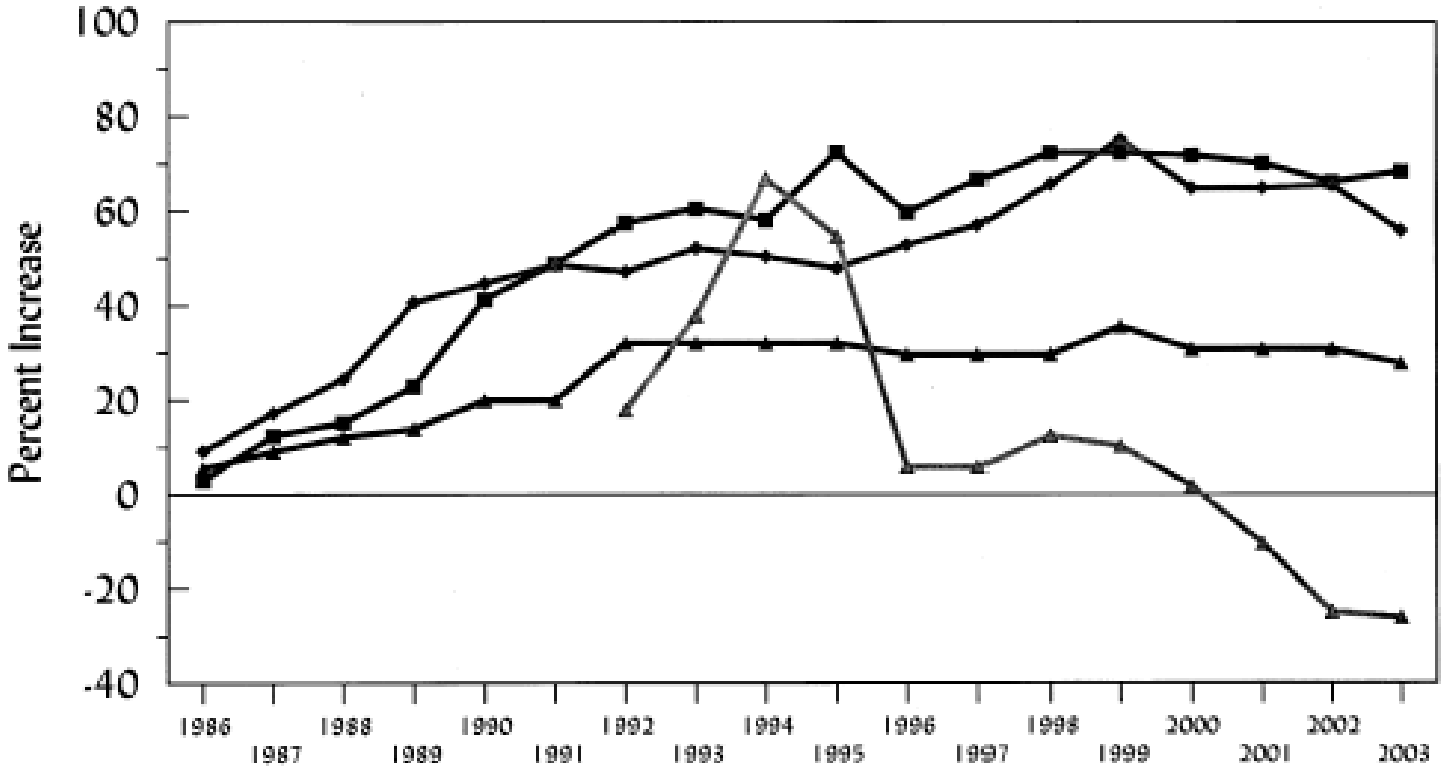
Analytical Throughput

FY 1989 to FY 2003




Analyses vs Laboratory Staff
1991 to 2003
EPA and ESAT Staff in FTE
Number of Analyses in Thousands
80
70
60
50
40
30
20
10
0
20
15
10
5
0
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Number of Analyses in Thousands
Total Laboratory Staffing

Increase in Staffing Since 1985



ESAT Figures before 1991 are not available

Established Center Capabilities

Environmental Chemistry

PCB Congeners - PCB analysis has traditionally been performed as Aroclors, the grouping of PCB congeners by PCB product description. As our understanding of PCB configuration and effect on human physiology has grown, it has become clear that more accurate risk assessments require individual PCB congener determinations. Some PCB congeners, especially those with a chemical configuration similar to dioxin, are of particular concern, demonstrating toxicities approaching dioxin. Several regional laboratories are capable of detecting PCB congeners.

Contacts:

❖ **Steve Reimer** (R10) - (360) 871-8718 (GC/ECD)

X-ray Diffractometry - Knowing the mobility of metal-bearing contaminants in the environment is essential to identifying the public health and environmental risks associated with a contaminated site. The particular compound in which a toxic metal occurs and the compounds which make up the surrounding matrix are critical factors in assessing metal mobility. Regional laboratories are adept at identifying element specific contamination in traditional environmental matrices. However, conventional chemical methods provide only part of the information needed for evaluating the interaction of the compound the element is in with the surrounding matrix. Compound identification is an important complement to chemical analysis for evaluating the mobility of metal-bearing contaminants in the environment and bioavailability of the element to organisms. X-ray diffractometry, a method finding widespread use in mineralogy and materials science, allows identification of compounds and thus adds a tool to chemical analysis for characterizing pollutants and evaluating their fate and transport.

Contact:

❖ **David Frank** (R10) - (360) 871-8708

Trace Metals Analysis - Adverse impacts of human and environmental exposures to trace metals are driving the need to detect these contaminants at ever lower levels. The regional laboratory is participating in several efforts to better detect and quantify trace metals contamination: speciating between different forms of arsenic to determine the hazard of the exposure and the best mitigation techniques, assisting the Office of Science and Technology to determine better procedures for determining Method Detection Limits to better characterize environmental data, and exploring new detection systems, like ICP/MS/DRC, capable of achieving the lower detection limits required.

Contact:

❖ **Isa Chamberlain** (R10) - (360) 871-8706

Fish Tissue Extraction and Cleanup - Fish and shellfish are widely consumed in the Pacific Northwest. Many indigenous and immigrant cultures consume far more of these foods than the balance of the population and far more than what human risk models suggest. As a consequence, these populations may be receiving excessive exposures to organic and metals contaminants. Regional scientists have developed unified digestion, extraction and analytical

techniques for fish tissue that permit substantially improved detection limits for a much broader array of analytes than previous techniques provided, allowing more accurate determination of population risk and environmental contamination.
Contact:
❖ **Gerald Dodo** (R10) - (360) 871-8728

Polybrominated Diphenyl Ethers (PBDEs) - PBDE contamination is an emerging concern in the United States. PBDEs found in Bromkal 70-5DE, a common fire retardant in foam pads and children's clothing, are finding their way into the environment including fish species taken from the Columbia River basin. Structurally similar to PCBs, their health effects may also be similar. The Regional laboratory used eleven congeners found both in Columbia River basin fish and Bromkal 70-5DE to determine Florisil elution patterns, GC retention times, and MDLs. Armed with this information the Regional Laboratory developed a method to separate, isolate, concentrate, detect, and quantify PBDE congeners using state-of-the-art instrumentation.
Contact:
❖ **Steve Reimer** (R10) - (360) 871-8718

Environmental Microbiology

Parasites in Drinking Water - Untreated or under-treated drinking water systems can expose the population served to two particularly onerous intestinal parasites, *Giardia* and *Cryptosporidium*. Almost eight years ago, the city of Milwaukie, WI suffered through an outbreak of *Cryptosporidium* that sickened several hundred thousand people, killing over 50 immuno-compromised individuals. The ability to detect these parasites in source water and determine the effectiveness of drinking water filtration systems is critical to EPA's responsibility to insure the quality of the public's drinking water supply. Two regional laboratories are proficient at *Giardia* and *Cryptosporidium* analysis and one CAS project is devoted to finding a more efficient methodology than that currently available.
Contact:
❖ **Stephanie Harris** (R10) - (360)871-8710

Groundwaters Under Direct Influence of Surface Waters: Microscopic Particulate Analysis (MPA), developed at the Region 10 laboratory, is used nationally to assist water utilities and primacy agencies in determination of ground waters under direct influence of surface water microorganism contaminants. Water sources that are designated as being "Under Direct Surface Influence" must either meet stringent requirements to remain unfiltered or install a treatment system to improve the water quality. The Region 10 laboratory is the only EPA laboratory with this capability and has provided states, utilities, tribal governments and military installations with training, inspections, analytical and technical assistance to help with this determination.
Contact:
❖ **Stephanie Harris** (R10) - (360)871-8710

Progress Reports on Ongoing CAS Projects

Environmental Chemistry

X-ray Diffractometry (Region 10) - Evaluation of portable X-ray fluorescence (XRF) sensitivity for metals in X-ray diffraction (XRD) specimens continues as part of an effort to incorporate XRF analysis into the Region 10 XRD method. Complementary XRF analysis allows timely screening of samples for those with the most relevant contaminant concentrations, provides an aid in phase identification, and gives an indication of element substitution in non-ideal minerals.

Contact:

❖ **David Frank** - (360) 871-8708

Contaminants from Modern Wood Pulp Bleaching Processes (Region 10) - Changes in pulp mill bleaching processes resulting from regulatory restrictions leave pulp mill effluents largely uncharacterized. This project has been designed to identify environmental contaminants from modern pulp mill effluent. A review of the literature has been conducted. A Time-of-Flight GC/MS instrument capable of better resolving the highly complex mixtures of organic compounds expected from the mill effluent has been brought on-line. The instrument has demonstrated a capability of better distinguishing among very closely eluting peaks. For example, mass spectra from the analytes 3,4,5-trichlorocatechol, pentachlorophenol,and the 13C6 analog of pentachlorophenol, compounds which elute within a few hundredths of a second, can be clearly distinguished. This would be impossible under the same conditions on the quadrupole. The discretionary nature of this project has precluded sample collection for this project as yet due because sampling staff has been fully committed to higher priority projects. Samples will be collected for this project at the earliest opportunity.

Contact:

❖ **Peggy Knight** - (360) 871-8713

Environmental Microbiology

Polymerase Chain Reaction Capability for Protozoans (Region 10) - *Cyclospora cayantensis* oocysts have been acquired for use in development of this technological capability in the regional laboratory obviating the need to use a surrogate organism. . New equipment has been obtained for use in PCR is providing the analysts with "real time" results. Work is underway using a technology which combines filtration with DNA purification and isolation which will dramatically increase the speed and efficiency of the method. The PCR facility in the new wing at the Manchester Laboratory has improved our ability to ensure the purity and accuracy of the results.

Contact:

❖ **Stephanie Harris**, D.V.M. (R10) - (360) 871-8710